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East Europe Report

ECONOMIC AND INDUSTRIAL AFFAIRS

(FOUO 3/80)



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CZECHOSLOVAKIA

IMPROVEMENT OF INVESTMENT INDICATOR PROCESS DISCUSSED

Prague POLITICKA EKONOMIE in Slovak No 2, 1980 pp 179-188

[Article by Jaroslav Fidrmuc: "Main Possibilities for Improving the System of Indicators of Investment Process Management"]

[Text] Sharp criticism of management has recently focused particularly on the inadequate mutual ties between the plans and the closely related supplier-customer relations.

In his concluding remarks on the responsibility for these shortcomings, G. Husak pointed out already at the 12th plenary session of the CPCZ Central Committee in December 1978:

"A great deal has been said here about supplier-customer relations, about interlinking of plans and so on. Certainly, the State Planning Commissions and the planning commissions of both republics are responsible for much of it. The plan is drawn up, not only by these organs, however, but also by the ministries, economic production units and enterprises. It is necessary to improve the entire system of planning: stronger mutual links must be established within the plans; supplier-customer relations must be put on a firmer basis; the authority and mandatory nature of the plan must be enhanced...In 1980 and during the Seventh Five-Year Plan, we will have to make greater progress in economically stimulating the implementation of these intentions."¹

We may add that research also bears its share of responsibility for these shortcomings because it still has not focused its attention on improving the comprehensive system of management of efficiency and quality which, following its experimental verification, would be the axis of the system of management in the period of the Seventh and obviously of the Eighth Five-Year Plan as well.

The extent to which the inconsistencies and unprogressiveness of the system of indicators itself account for lack of mutual ties between the plans and supplier-customer relations, and for the shortcomings in management in general, can be judged from the following facts:

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Already when the construction projects are designed the design organizations and design departments of general directorates are pressed by the system of indicators according to which they are appraised, not to reduce, but to increase the budget costs of projects. The investor organizations and departments are unable not only to oppose these pressures, but have essentially the same interest as the design sector in the highest possible budget cost of projects because they also are assessed by the volume of capital investment. The same is true of the suppliers during the actual realization of the capital investment project. Until recently, they were interested in selecting a project with the highest proportion of material costs, in replacing cheaper materials with more expensive ones, and they continue to be interested not in reducing but in increasing the scope of unfinished projects, in raising wages above the level specified by the budget by adding the profit margin to them and so on. Other indicators such as the volume indicator for construction projects to be finished as well as profitability and quality indicators only more or less unsuccessfully restrict or contradict this basic tendency, which asserts itself through material incentives not in efficiency and quality, but in the quantity of outputs achieved. Contradictions and lack of mutual ties in this system of indicators are also reflected in supplier-customer relations, but also intensify the shortage of investment materials and labor shortage. The contradictions in the system of indicators according to which the enterprises are assessed in fact result in conflicts between party-political and political-educational work in the enterprises because they objectively give rise to potential conflicts between the group-enterprise and society's interests.

The social needs of capital investment assert themselves through the investors. In accordance with the investment needs and [available] investment resources, investment funds are allocated and limits are set for the investors. But the investment capacities are developed, according to the plan, along a completely different line--management of suppliers. The considerable amounts of unused investment funds bear witness to the great differences in management of the investment process along these two lines.

It is strange that there is a difference amounting to about Kcs 1.5 billion within the SSR alone every year--with only a slightly declining tendency--between the records on basic construction work carried out in connection with the capital investment projects which are kept by the building contractors and investors, respectively. A detailed analysis of records on individual construction projects carried out in recent years would be necessary in order to find out reliably what these differences actually conceal.

All this offers additional evidence of lack of ties and contradictions between the system of indicators, specifically in capital investment, and the system of records based on them.

The two key questions are these: what kind of decisive-comprehensive indicator for assessing of capital investment should be chosen, and how other indicators of management of the investment process should be grouped around it.

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Practical attempts to find the best possible answers to these questions in management of the socialist economy have been taking place since the second half of the 1960's. First an attempt was made to switch from the gross production indicator, which set the limit just for the total volume of work and deliveries, to the indicator of gross actual outputs. It encountered the greatest problems, however, precisely in capital investment because it necessitated a switch from volume billing to billing by projects. The Byelorussian experiment which was gradually expanded to include other federal republics, and which was followed very closely in other socialist countries including the CSSR, revealed possibilities for overcoming these difficulties. To be sure, the Soviet economists themselves, while generally appreciating the advantages of this more progressive criterion which directed the enterprises to the final results of their work, for a long time also pointed out some of its persisting serious defects. In the first place, it did not eliminate design engineers', investors' and suppliers' interest in the higher price of construction projects, and essentially provided them only with the incentive for completing projects as soon as possible. This made linking of this indicator particularly to the indicators of profitability and quality even more difficult. But the indicator of gross actual outputs did not even force the contractor to carry out those construction projects which were most needed from the standpoint of the entire society. Moreover, the design engineers and contractors, guided by the system of value indicators, chose the construction project in accordance with their interests (and various pressures), frequently in profound conflict with the society's interests. A big step forward toward the solution of these problems was not taken until the implementation of the document, approved by the CPSU Central Committee and USSR Council of Ministers in July 1979, on further improvement of the management of the Soviet national economy according to which the USSR ministries and ministerial organs and councils of ministers of federal republics were to switch, completely beginning in 1981, to billing, between investors and contractors, for completely finished projects and capacities already put into operation, for not yet finished projects, individual parts and buildings prepared for production start and for providing services on the basis of the budget costs of building production. The branches that are ready for it should also apply the standard of net production excluding material costs as the indicator of the newly-produced value which reflects the practical contribution of the enterprise to the production of the national income in accordance with the filling of investors' specific orders.

As early as the second half of the 1960's, however, an attempt was also made--specifically in the CSSR--to switch to the much narrower key value indicator--the indicator of gross income. This indicator--much broader, on the other hand, than the enterprise profit incentive which was one-sidedly emphasized in the process of undermining and dismantling central management during the 1968-1969 crisis--only multiplied the overpayment and speculative hiring of workers. This indicator therefore had to be dropped during the economic consolidation process. In capital investment, for example, it helped produce such differences in enterprise resources that they completely reversed

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the progressive tendencies in the socialist economy. Specifically, contrary to societywide needs, capital investment again increased more rapidly in the CSR than in the SSR (by 8.1 percent in the CSR and by 7.9 percent in the SSR in 1968).

Nor did the transition to the almost exclusive, dominant position of profit prove successful under the conditions of overestimation of tendencies toward the decentralized system of management as it manifested itself in Hungary's economy in the late 1960's and early 1970's. At the meeting of a work group of the problems commission for improving the planned system of the management of investments in CEMA countries at Bratislava in September 1977, the head of the Hungarian delegation and coordinator of this group G. Havas emphasized that these tendencies, which had manifested themselves in Hungary in the past, among other things had unfavorably influenced the effectiveness of capital investment specifically. This method, in his opinion, did not result in effective management of certain more extensive investment complexes.

The development of the set of indicators for the management of the investment process in the socialist economy to date has made it clear that sudden, revolutionary changes can be carried out in the system of management only with difficulty. Management has built-in inertia nurtured by the ingrained mode of thought and action of economic workers, and the new more progressive indicators, no matter how far they are from the beaten track, sooner or later are adapted to the established habits.² Here it is necessary to overcome this inertia only gradually, using an entire set of systems indicators, measures and political work, and this process will take some time. Sudden, revolutionary changes always produce chaos in the system of management in where even substantially more progressive indicators can be misused for antisocial purposes.

The course of the gradual but systematic verification of new, more progressive indicators as well as of an overall, more progressive system of management was also embarked upon in the CSSR, specifically with the Comprehensive Experiment in Efficiency and Quality Control which was extended on 1 January 1979 to include selected VHJ [economic production units] in the building sector. It was the need for a comprehensive, systematic approach to the management of the national economy as a whole that also made it necessary, after the very first year of verifying this experiment in industry to apply, in accordance with the resolution of the 12th plenary session of the CPCZ Central Committee in December 1978, some of its new features to the entire economy, specifically, emphasizing the dependence of wages on the value-added [indicator] alone, emphasizing and standardizing higher prices based on better quality, economic penalties and compliance with the specified assortment so important precisely to capital investment.

It is beyond dispute, however, that if the resolutions of the 15th CPCZ Congress are to be consistently implemented--which set as an especially important task for the federal government and national governments, planning organs and ministries the adoption of a set of measures to reduce the scope

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of unfinished projects and meet planned construction deadlines, to prevent budget costs from being exceeded more effectively, and particularly to allocate the largest possible amount of funds for the rapid completion of production capacities and putting them into operation--it is imperative to lay even greater emphasis on the improvement of the system of the management of the investment process.

In the future conceptual development of improvement in the system of indicators for the management of the investment process, one can follow these main courses:

1. Making Mandatory Indicators of the Plan More Specific in Structure, Effectiveness and Quality

This approach--although, apart from the emphasis on wage dependence on the enterprises' added value, it still uses as the key indicator the indicator of gross production, volume of investment work and deliveries, with the well-known and frequently criticized defects--can still be regarded neither as completely obsolete nor as one that has already exhausted all possibilities for further development.

The directive determination of specified volumes of investment work and deliveries during the decades of socialist construction demonstrated the possibility of carrying out, relatively proportionately, extensive capital investment, incomparable with capital investment under the capitalist system of management, of which we are justly proud before the entire world. A positive role in this approach was also played by the index method of planning, which systematically promoted this development. At the present time, this system is significantly improved particularly through the specification of plan indicators in terms of structure, effectiveness and quality.

On the basis of the resolutions approved by the 12th plenary session of the CPCZ Central Committee, industrial enterprises already keep separate records on deliveries to selected construction projects with budget costs exceeding Kcs 2 million, deliveries for export to the socialist states and deliveries for export to the capitalist states. If any of these indicators or indicator of effectiveness or indicator of technological development is not complied with, premiums and bonuses are reduced by 20 percent. In accordance with the above resolutions, punitive damages, fines, cost of rectifying defects, price discounts and similar losses are not only no longer included in the outputs but are deducted as penalties from the outputs, receipts and profit, and thus affect wages, premiums and bonuses.

In comparison with the past, quality is more markedly emphasized. For products subject to testing the following provisions apply: if the product is included in the first quality grade, the enterprise gets its price increased by as much as 25 percent of the wholesale price; for the second quality grade the standard price applies; if the product is included in the third quality grade, the price is reduced at least by 15 percent and if this

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- happens repeatedly by as much as 30 percent of the wholesale price. In order to promote innovation processes, the price of technically progressive products may be increased by as much as 25 percent for a period of 3 years. - On the other hand, the price of technically obsolete products is reduced at least by 15 percent, with the conditions however that their manufacture - must continue until they are replaced by a new, technically progressive product.

The present system of indicators for management of the investment process also offers other possibilities for improvement in this area during the next period. For example, in the sensitive problem of interlinking individual indicators with the entire individual sections of the plan there are great possibilities for improving the system of [gescie] general coordinators and balanced planning. Modern computer equipment will make possible an increasingly more detailed balancing of work and deliveries not only for selected construction projects with budget costs exceeding Kcs 2 million, but also for other projects. More consistent checks on the construction budgets may also substantially enhance the authority of the plan in capital investment. Likewise, more consistent checks on economic agreements and reasons why these economic agreements are not honored and violate the principles of supplier-customer relations can greatly help in solving the problem of this, by far the weakest link in the implementation of the capital investment plan. Finally, many problems will be solved if increasingly bigger reserves will be earmarked for unanticipated economic needs as the economy develops.

The volume of those fixed assets can be directivevely determined that must be eliminated, and funds put aside specifically for their replacement.

It is justly demanded that the plan must be more differentiated depending upon the conditions of individual organizations, and also that the very system of indicators for the management of capital investment must be more differentiated because it cannot be identical for different sectors and branches. All this can be improved by further specification of plan indicators in terms of structure, effectiveness and quality.

- It is true that the system of indicators based on the increasing specification of directivevely assigned tasks is too weak for the fundamental solution of some long-term tasks of economic and particularly investment development. For example, the absence of ties between the investment plan and the plan of scientific and technological development is often criticized, because many achievements of basic and applied research are only very rarely, if ever, included in the investment plan that would transform these achievements into reality. Although every task of the state program of basic research must contain the implementation outputs, the application of results in social practice or the economic contribution, this does not yet mean that all obstacles have been removed from the road to their implementation.

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This implementation is, specifically in the investment plan, very complex. The preparation and implementation of an investment project takes 10--12 years. Effective stimuli, however, are lacking for including all technological achievements in the investment plan, and also for flexibly changing the plan on the basis of the latest scientific and technological achievements. The accomplishment of volume tasks on which the evaluation of enterprises and organizations is largely based does not require the optimization either of the plan of investment development or of the plan of technological development, and the present system of indicators, together with the short-term nature of the operational plan, promotes technological conservatism instead, for which experiences of economic practice offer ample proof.

The only way out from the present system of indicators is the directive assignment of additional tasks: assignment of obligations in the application of all achievements of technological progress in social-economic practice; directive specification of technological progress in individual investment projects of key importance and in the entire areas of rationalization (for example in the fuel-energy sector), directive determination of the percentage of technically progressive products, and so on. The more rapid and the more general scientific-technological progress is, the more difficult it is for the center to decide on its application in the investment plan. Moreover, even the most rational decisions by the center cannot make up for lack of interest on the part of lower levels of management in rationalizing investment and technological progress.

The primary emphasis on effectiveness and quality resulting among other things from the high degree of saturation of the society with quantity alone--proclaimed at the 14th CPCZ Congress and again and more urgently at the 15th CPCZ Congress--undoubtedly also requires a new system of indicators based on other key indicators.

It must also be emphasized that no long-existing system of indicators, including the subsystem of indicators for the management of the investment process, can be replaced by another one until this new system is thoroughly tested and proves itself better, superior.

2. [Comprehensive Experiment in Efficiency and Quality Control]

It is necessary to elaborate, define with more precision and further develop the Comprehensive Experiment in Efficiency and Quality Control also for the investment process into a well-rounded and--in comparison with the present one--qualitatively more perfect system of management, including a self-contained and mutually interlinked system of indicators on the national economic scale.

In the present experiment, whether conducted in industry or in the building sector, the volume of gross production, which was the principal indicator of plan fulfillment until now, loses its priority position because as an indicator it fails to ensure social effectiveness or to meet other qualitative

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requirements. In its stead, specifically in the building industry and in connection with the elements of the Byelorussian experiment, particularly the deadlines set for completion of construction projects depending upon their importance for the national economy, assume key significance. The experimenting VHJ, Kosice Industrial Construction Projects, has introduced two mandatory indicators of effectiveness: profitability in relation to production costs and the utilization rate of installed machinery, while the evaluation of enterprises and entire VHJ's is based on the so-called "reduced outputs," that is outputs from which the effect of materials and energy consumption in particular is eliminated.

In the area of the reproduction of fixed assets proper, the experiment in selected VHJ's concentrates on the more effective management of investment projects for which a limit is set (construction projects with budget costs below Kcs 2 million and machinery not included in the budget of construction projects) in order to maximize the percentage of progressive modernizations and investments with rapid returns. Funds for this category must be created by the VHJ itself according to the specified standard, while a certain part of funds will be administered by the central branch organs and used for projects requiring an increase in the labor force, import of machinery and equipment from the capitalist states or insuring the tasks of socialist economic integration, technical development and so on.

The complex relations among the participants in the investment process--investors, design organizations, contractors and subcontractors, but also future users of capacities under construction--are why the application of the Comprehensive Experiment in Effectiveness and Quality Control, its definition with more precision and further development is especially complex in this area of the national economy. It is, however, also very important because the investment process is the carrier of the dynamics of the entire national economic plan.

A substantially bigger interest in effectiveness and quality--in capital investment particularly in shortening of the deadlines set for completion of projects, reducing budget costs and increasing the useful effect of investment work and deliveries--from the outset reveals many big reserves which were previously hidden in the background.

In the first place, much more emphasis is laid on the fact, which was also occasionally formally stressed in the past but from which no adequate conclusions were drawn--namely, that the preparation of construction projects by the investors and design organizations is of decisive importance. The present stimuli and saction tools in the area of economic law, however, were primarily applied to supplier building and assembly organizations and only to a limited extent to other participants in capital investment. It has become clear that the new incentive measures must in the first place support early preparation of projects by the investors and design organizations because this will stimulate interests on the part of supplier organizations not only in shortening the periods of actual construction, but also in reducing the budget costs of projects.

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It has become also clear that there is a conflict between the interest in improving quality and, in the broader sense, in the maximization of useful effect of investment projects under construction on the one hand, and lagging quality control on the other. Specifically, the VHJ Industrial Construction Projects Kosice applied the former criteria of quality planning and evaluation as late as 1979, the first year of experiment. It was therefore all the more justified that this VHJ sped up preparations for the introduction of the comprehensive system of quality control as of 1 January 1980 making use of experiences in this area by the VHJ Surface Construction Projects Bratislava.

True, due to a variety of causes many principles underlying a more effective system of indicators in the realization of capital investment are difficult to enforce even in the building sector itself.

In contrast to the experiment in industry, the VHJ Industrial Construction Projects did not begin to verify the three-year operational plan, but extended the planning period merely by introducing the so-called two-year sliding plan and combining it with the one-year operational plan. Experiences from industry also revealed how difficult it was for the enterprise, despite considerable tolerance (for example 4 percent), to draw up a mandatory three-year operational plan. Moreover, the supplier-customer relations in the building sector, which still is largely individual production, are particularly labile. Yet even so, the transition to the two-year sliding plan combined with merely a one-year operational plan represents a big advance for the building organizations, because it makes possible a more consistent preliminary and comprehensive preparation of planned tasks and thus also a more even and continuous utilization of production capacities, which is the primary prerequisite both for increasing efficiency and reducing the scope of unfinished projects. The two-year plan also creates better conditions for comprehensive securing of deliveries of materials, particularly those in short supply, and for regulation of complex cooperation relations among the relatively large number of subcontractors, which is typical of the capital investment sector. On the other hand, the one-year operational plan still in use does not stimulate the enterprises' interest in technological progress and related measures because the one-year period for which the funds are allocated and tasks planned is really too short. The VHJ Industrial Construction Projects tries to cope with the situation in the area of technological development by setting up a joint fund for financing sectoral and enterprise projects. It wants to systematically and centrally coordinate the selection of technological development projects by the general directorate in order to implement the main ideas of the experiment in regard to shortening construction periods, increasing labor productivity of its own performance without an increase in material consumption, and increasing profitability in relation to the total production costs. The principal purpose, however--the stimulation of enterprises' material interest in technological development--cannot be achieved by the centralization of decision-making in this area. It can only provide incentives for promoting greater technological progress in the future, that is during the Seventh Five-Year Plan.

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It is also more difficult in the building industry to strengthen the motivating function of the system of indicators of wage control according to the plan. Although the principles governing the basic and incentive components of wages are in the experiment essentially identical for industry and the building sector--the basic component is determined by the share in added value and the incentive component by the absolute limit depending upon the attainment of planned profitability and compliance with two additional conditioning indicators which reflect the material structure of the economic plan--in contrast to industry, VHI Industrial Construction Projects Kosice considers setting up a bonus fund equal not to 20 percent, but only 14 percent of the total volume of wage funds. This means that there will continue to be smaller incentives in the building sector than in industry generally. Although this was also typical of the building industry in the past, this will not benefit the building industry and particularly capital investment in any way. On the contrary, the fact that the investment process is the carrier of dynamics of the plan speaks in favor of reversed or at least equal priority of profitability in the building sector and all of capital investment.

In elaborating, defining with more precision and developing the experiment in the management of the investment process, it is necessary to guard against some illusions. In addition to assigning priority to efficiency and quality, the experiment--in contrast to the previous system of management--no longer stimulates the enterprises to the antisocial hunt for the largest possible material need. The assessing indicator of added value or reduced outputs, however, does not stimulate material savings either. Moreover, it still does not put an end to the equally antisocial interest of the enterprises in increasing the labor force as the key factor in their added value to which--expressed in the volume of wage funds--the percentage of profit is simply added. The possibility of inflating their own performance is thus only restricted, but not completely eliminated.³

Both these facts therefore call for a multitude of additional, more specific, supplementary and conditional indicators which would regulate enterprise activity in accordance with society's interests. This further complicates the problem of attaining consistency of indicators which is particularly sensitive precisely in the management of the investment process. At the same time, however, both of these facts indicate that it would be erroneous to regard as the optimal solution to the system of management the effort to elaborate and define with more precision the Comprehensive Experiment in Efficiency and Quality Control and particularly the value added (reduced output) indicator as the key indicator for assessing plan fulfillment. In other words, it is only an important, progressive step toward this optimization (or to put it differently, only a half-way measure) corresponding, however, to the present stage of development of economic theory and economic practice.

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3. [Assessment of Enterprises According to Actually Economic Results Achieved]

It is necessary to eliminate not only partially, but completely the evaluation of enterprises according to the principle: "the higher the costs, the higher the outputs assessed" and to switch to the consistent evaluation of enterprises on the basis of economic results actually achieved.

Despite all the progress made in the optimization of the system of management and focusing its attention on the increase in efficiency and quality, it is indisputable that the implementation of tasks in this principal area of economic activity has been slow.

In analyzing the causes of this contemporary development in the Soviet Union, L. Brezhnev emphasized: "This is hindered not only by objective circumstances, but also by inertia--inertia in planning, in management methods and perhaps primarily in economic theory."⁴

Indeed, perhaps primarily the inertia in economic theory prevents going even further and more consistently in the effort to completely eliminate the assessment of enterprises according to the output achieved--actually production costs--though in the Experiment in Efficiency and Quality Control only according to the actual value added.

Not only in the management of the investment process, but also generally this means that the fulfillment of enterprise plans must be evaluated not according to the key value added indicator, but according to the indicator of economic results actually achieved, because the economic effect--the objective result of enterprise management--can be determined only after enterprise expenditures not only on material consumption, but also remuneration of their labor force are deducted.

How much apprehension there is however, about taking this step forward--apprehension that obviously stems from the identification of socialist profit with capitalist profit! Finally, the lack of attention paid to the elucidation of the essence and forms of profit under socialism, laws that govern its size (attainment of average profit and maximum profit as the goal of the increase in management efficiency) and to its developmental tendencies in individual phases of socialist construction undoubtedly betrays the same apprehension about taking a step forward from the well-trodden path of inertia in economic theory itself as the guide for improving the system of management in economic practice.

It is true that even experimenting with the use of profit as the basic indicator of enterprise material incentive under the conditions of socialism has so far not resulted not only in the optimization of management, but on the contrary such a basic indicator has frequently incited the enterprises to antisocial behavior.

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Soviet economic theory, which has already examined these questions in greater detail,⁵ reached the conclusion that it was not the idea underlying the profit indicator which was wrong, but its wrong formulation which was at fault. The same is true of the wrong formulation of standards of incentive derived from it. If profit as the basic indicator of enterprise incentive is to discharge its function properly, certain economic conditions must be met which Soviet theory is analyzing in detail in many publications. Principal among them are objective, economically justified prices that perfectly perform the incentive and criterial function, and the assumption that the enterprise profit is the real (and comprehensive) indicator of the overall quality of the collective's and workers' activity.

It is not easy to meet these economic conditions, particularly in capital investment which for the most part involved calculation of individual construction projects, but it gradually becomes imperative [to do so] nevertheless. It is significant in this respect what attention is paid to checking construction projects' budgets, for example in the Soviet Union especially in connection with the Byelorussian experiment. In the building sector an entire hierarchy of organs has been set up beginning with a special administrative unit at the ministry all the way down to the technical work groups in the enterprises. Much attention is also paid to training personnel specialized in this work. In both these respects, we have to work hard to catch up with the Soviet Union. The budget costs are firm and averaged. Although they do not reflect specific conditions of individual construction projects, they do constitute a barrier against subjectivism in their increase and this is decisive at the present time.

If profit is really to be the basic indicator of enterprise material incentive, it cannot be tied to the compliance with other, quantitative or qualitative, indicators. If it is, these indicators, such as fulfillment of the sales plan, labor productivity, quality of products and so on, become the basic assessing indicators of enterprise work. The increase in profit, however, cannot then be earmarked for the obligatory appropriations to the investment or reserve fund, for example. In my opinion it cannot be unambiguously asserted that "...the amount of earned income is the subject of interest of the individual enterprise worker" and that "...the material interest of the enterprise is focused on the increase in the average income per worker" as emphasized by L. Rusmich.⁶ With the growth of socialist work collectives, the interest of individual workers also increases in the augmentation of the fund for cultural and social needs and its optimal distribution as well as in the investment and reserve funds as the source and safeguard of further development. Moreover, there is real societywide interest in lower prices or increased state subsidies for housing construction, for example. Nevertheless, precisely because the interest in increasing personal incomes is still decisive, it is true that, if the increase in profit is (obligatorily) used for other purposes, it loses its function as the basic enterprise material incentive.

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Generally speaking--if the economic conditions are met, chiefly if profit and price perfectly discharge their incentive function--the fact that a building enterprise selects for its production program a project which is most advantageous in terms of price and profit, is not a sign of enterprise antisocial behavior, but the goal of the optimization of the system. Obviously, however, such an ideal state can never be achieved. On the contrary, administrative interventions by the center will always be necessary in the process of drafting, but also implementing enterprise plans not only in order to correct the effect of imperfect economic tools, but also in order to press--specifically in the investment plan--the urgent societywide priorities most vigorously and effectively.

In order not to act counter to enterprise profit interests, these interventions by the center either must have an objectivized economic form or at least the directive assigned tasks must be accompanied by the objectivized material incentives.

Precisely for these reasons K. Vlachynsky proposes as the indicator of enterprise material incentives the "khozraschet profit"⁷ from which--by the obligatory levies to the state budget and the part of the redistribution of part of incomes among the enterprises within the VHI and among VHI's within ministries--those external (price and other) influences that decisively affect profit at the present time would be eliminated. (We may note in this connection that this objective is to some extent achieved in the Soviet Union through the reduction of the balance profit by the tax on frozen funds, fixed and revenue-based payments and interest on loans.)

Yet even this "khozraschet profit" does not on the one hand guarantee compliance with urgent social priorities specifically in capital investment, while on the other hand its function as the indicator of enterprise material incentive is seriously undermined by the fact that its preponderant part (87.5 percent in the CSSR during the Fifth Five-Year Plan) is paid in the form of obligatory levies to the state budget and supervisory organs in addition to the obligatory allocations to the enterprise investment and reserve funds.

In this context particular attention must be paid to the specific formulation of the enterprise material incentive chosen in the Comprehensive Experiment in Efficiency and Quality Control for stimulating effective production for foreign trade. It was decided to allocate funds for material incentives for these purposes--shares in foreign trade profits or losses--directly to the enterprise funds (up to 1 percent of available funds to the bonus fund, up to 0.1 percent of usable wage funds to the fund for cultural and social needs, to the development fund and reserve fund to cover import losses and risks) and to exempt them from the obligatory levies of profit.

We have already seen that this economic tool, because of its direct and very stimulating effect, is especially effective in combination with the substantially higher prices for first-grade products. If it covered the entire

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economic activity of enterprises and removed the limits set for the allocations to the bonus fund and the fund for cultural and social needs we would have a new and comprehensive indicator of enterprise material incentive which would essentially represent the balance of bonuses (and material penalties) of enterprise collectives for the timely, economical and good fulfillment of the task (and their negative counterparts) as the real economic effect of enterprise management.⁸ Other indicators could then be grouped around this indicator--indicators of the management of the investment process such as indicators of construction deadlines, unfinished projects, useful effect of investments and so on, which would stress specific and partial aspects of fulfillment of enterprise tasks.

Naturally, it is necessary not to be afraid of marked material incentives for shares in profit or losses in accordance with the principle: "if you work better, you will be considerably better off, but if you work worse, you will be seriously penalized in a similar way." The past course of the Comprehensive Experiment indicates that such fears really exist and are given expression in practice. Certainly, it is not possible to put the revised system of management into effect immediately without some transitional period. But it is also impossible to delay a substantial increase in effectiveness of material incentives unreasonably.

I think that such a substantial increase in the effectiveness of economic incentives in the final analysis is also suggested in the document of the CPSU Central Committee and USSR Council of Ministers of further improving the management of the Soviet national economy, when it emphasized that it is necessary to enhance the effectiveness of economic tools and stimuli and to make material motivation directly dependent upon the efficiency and quality of work, on the fulfillment of planned tasks and results of production activity.

The above main courses of improvement of the system of indicators of the management of the investment process may be combined in practice. The first two approaches, however, are only preliminary stages for achieving the third one as the target solution in the present strategic revision of management because only the third course embodies a consistent transition from the decisive assessing indicator of gross turnover--enterprise [production] costs--to the indicator of real economic effect as the basic stimulus of enterprise material incentive. Only in the third alternative can the number of mandatory indicators also be radically reduced (in the extreme case of a perfectly designed indicator of real economic result, they can be reduced to one, around which the merely supplementary indicators can be grouped), because it is not necessary to compensate for the shortcomings of the basic assessing indicator.

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FOOTNOTES

1. PRAVDA 9 December 1978 p 2.
2. Reference to the track is not accidental: the higher the velocity of the moving system, the broader the gauge of the rails that must be chosen.
3. The illusion that the indicator of reduced outputs also eliminates the enterprises' interest in increasing their labor force may be created by such information spread by the mass communication media such as the following: "In evaluating the activities of enterprises as well as of the entire VHI participating in the experiment, we shall take as the basis of evaluation the so-called reduced outputs, that is outputs from which the effect of material and energy consumption has been eliminated. This new tool will make us concentrate even more on increasing labor productivity..." (Quoted from the article "An Important Economic and Political Task," PRAVDA 27 February 1979 p 5).
4. L. Brezhnev's election campaign speech at the meeting of voters of the Bauman election district in Moscow. PRAVDA 3 March 1979 p 3.
5. L. Rusmich made interesting comment on the views of Soviet theoreticians on these questions in his articles in POLITICKA EKONOMIE Vol 1979 No 1 and particularly in Vol 1979 No 3 pp 262-265.
6. L. Rusmich, "Economic Interests and Khozasaschet," POLITICKA EKONOMIE, Vol 1979 No 3 p 262.
7. K. Vlachynsky, "The Position of the Profit Indicator in the Enterprise Sphere," EKONOMICKY CASOPIS Vol 1978 No 7 p 643.
8. I was already gradually working out its formulation in my articles "One Alternative for Making the System of Indicators in Capital Investment More Effective," POLITICKA EKONOMIE, Vol 1978 No 12 and "Consistency of Plan Indicators, Capital Investment and the Problem of a General Comprehensive Indicator," EKONOMICKY CASOPIS, Vol 1979 No 9.

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PLANT PROTECTION AGAINST AIR POLLUTION IN SLOVAK AGRICULTURE

Bratislava AGROCHEMIA in Slovak No 3, Mar 80 pp 81-83

[Article by Docent Engr Stefan Trojan, Cand.Sci., Engr Anton Grejtovsky, Engr Ondrej Hronec, Chair of Agricultural and Environmental Disciplines, Veterinary College, Kosice]

[Text] Meeting the tasks for further development of our agriculture set forth by the 15th Congress of the Communist Party of Czechoslovakia calls for solving problems by intensifying all elements of the agricultural and food industry complex, i.e., more effective and purposeful application of scientific findings in everyday practice.

The central element in further development of our agriculture remains plant production in its close affinity to the needs of animal production. The level of plant production, expressed in the amount of yield of agricultural crops and their quality, is under normal conditions closely dependent on an entire series of environmental factors. The latter are with increasing tendency and significance compounded by factors which are abiotic in character, such as phenomena accompanying industrialization and increasing energy consumption, both of which have substantially affected the biological part of nature.

The atmosphere of industrial regions is pervaded by a number of gaseous and solid substances of varying chemophysical properties. Their qualitative relative abundance is determined by the nature of the production and the fuel base of the given industrial branch. From the viewpoint of detrimental effects on vegetation, the dominant factors are sulphur dioxide, hydrogen fluoride, flue ashes and dust. Other compounds (Cl, Pb, tars, nitrogen solutions, etc.) constitute harmful substances of a more or less local character [1].

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This situation acquires a particular significance in our conditions. Our fuel and energy base depends for the most part on the use of domestic, lesser quality fossil fuels with a high contents of sulphur and other harmful substances [2], such as As and a great number of trace elements (Be, V, Cr, Pb, Mn, Cd, Ni, Se etc.) having potential toxic effects not only on plants, but, naturally, also on all complex food chains.

The Economically Most Significant Relations Between Air Pollution and Detrimental Effects on Plant Life

The first systematic observations regarding the effects of smoke products on plants began already in the last century. The incentive for an intensive study of the problems in this area was provided by the extensive damage to vegetation following WWII. Its objective was primarily quantification of the negative effects of air pollution on plants of economic importance. Yet, no reliable definition could be formulated to date in regards to the requirements on air quality from the viewpoint of optimum conditions for the flora of a region.

To identify the relation between a harmful substance and plant reaction, it is highly important to select a suitable criterion for measuring the specific effects [3]. This is of decisive significance for determination of critical (limit) concentrations which, as regards the atmosphere, can produce acceptable conditions for plants and associated forms of life [4].

From the economical viewpoint, yield and quality of plant products are of prime importance to assessing the impact of the effects under study [3]. However, such assessments of yield are often substantially limited. Changes in the quality of plants being studied are in many cases better suited for assessing the detrimental effects and their relation to the concentration of and length of exposure to harmful substances. Here we have in mind mainly more pronounced changes caused by an accumulation of harmful substances in plant products, restricting their further utilization (accumulation of Pb, Hg, F etc.).

In judging the degree to which plants have been affected by pollutants, Guderian, van Haut and Stratmann differentiate between two categories, namely "damaging" and "damage." They interpret "damaging" as any plant reactions (largely reversible) to polluted air (temporarily lowered assimilation, cell damage, necroses, premature defoliation, temporarily depressed growth, late blooming, etc.). On the other hand, under the term "damage" they include, from the aspect of the utility of the plant, only those effects that are measurably decreasing (damaging) the utility value of plants from the functional, economic or biocenotic viewpoint (e.g., lower yield, growth,

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quality, associative changes in permanent plant growth, etc.). Thus, according to the cited authors, damaging can, but need not always be the first degree of damage. Damaging produces, e.g., in sugar-beet leaves, an inhibited assimilation, which results in lower sugar contents and a crop of worthless bulbs. Defoliation during necroses of decorative plants, leaf vegetables, or in green cultivation of plants directly lowers their value, making damaging identical with damage. On the other hand, leaf necroses in general need not affect the amount of yield of the main product (damaging the leaf area of wheat need not have any pronounced effects on grain yield).

Determination of the extent of damaging and of damage represents thus a special task determined by the requirements on the utility value of the affected plant (its targeted utility).

At any rate, valid assessment of lower yield due to pollutants, or impaired quality of the plants cultivated, depends primarily on authentically obtained mutually comparable values regarding both affected and not affected plants [6, 7, 8].

Standardization of Air Quality and Protection of Agricultural Crops

A total elimination of air pollution and of its negative effects is, for all practical purposes, impossible. The sources of pollution are often of key importance to the national economy. For these reasons, all advanced societies look for solutions that would minimize any damaging and the resultant damage. The basis for limiting damage to vegetation or for improving the quality of air is formed by accepted standards or limits for individual components of the natural environment.

Directives of the Chief Hygienist of the CSSR, No. 34/1967, require that concentrations of the individual most important harmful substances in the atmosphere do not exceed, in isolated exposure, the values listed in table 1. This standard prescribes the highest admissible short-term concentrations (k_{\max}) and the highest admissible average daily concentrations (k_d) in open air. Thus, e.g., for SO_2 and dust the mentioned standard allows the following values: $k_{\max} = 0.5 \text{ mg/m}^3$ and $k_d = 0.15 \text{ mg/m}^3$.

Short-term concentrations are defined as the median value of the concentration at a given place in the time period of 30 minutes.

Average daily concentration is defined as median value of the concentration at a given place in the time period of 24 hours.

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The presence of short-term concentrations is allowed to the extent that they do not exceed the maximum admissible average daily concentration.

Dust fallout containing up to 20% of free SiO_2 in the amount of 150 t/km/year is deemed to be a hygienically tolerable value; at the same time, consideration is given to the size of dust particles and the pH value of water extract (pH 5 to 8), or, as the case may be, the contents of harmful substances.

Table 1. Maximum Admissible Concentrations of Key Harmful Substances in the Atmosphere (0°C, 1,013.25 kPa)

Harmful Substance	Maximum Admissible Short-term conc. k_{max} (mg/m^3)	Maximum Admissible Average daily conc. k_d (mg/m^3)
Dust	0.5	0.15
Sulphur dioxide	0.5	0.15
Carbon monoxide	6.0	1.0
Nitrogen oxides (such as NO_2)	0.3	0.1
Chlorine	0.1	0.03
Hydrogen sulphide	0.008	0.008
Lead (other than its tetraalkyls)	---	0.0007
Carbon disulphide	0.03	0.01
Arsenic (inorganic compounds, except AsH_3)	---	0.003
Fluorine (inorganic gaseous compounds)	0.03	0.01
Soot (amorphous C)	0.15	0.05
Formaldehyde	0.05	0.015
Phenol	0.3	0.1
Manganese (such as MnO_2)	---	0.01
Sulphuric acid	expresses 0.01	---
Nitric acid	as 0.01	---
Hydrochloric acid	H^+ ions 0.01	---
Ammonia	0.3	0.1
Benzene	2.4	0.8

The above listed admissible concentrations of harmful substances form the basis for computing compensation for damages caused by pollutants to agricultural production (Government decree No. 40/1963 of the Codex and implementing instructions, see Bulletin of the Ministry of Agriculture and Food, part 19 from 1970).

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The shortcomings relevant to implementation of these valid legal standards in practice are pointed out by a great number of data [9, 10, 11]. It is more or less a matter of general knowledge by now that the concentrations tolerated by the applicable norms are too high to prevent damaging and damage to vegetation. Current findings regarding the limits for concentrations (e.g., of SO₂) show that they are far below the prescribed admissible concentrations. Tables 2 and 3 list the results obtained in fumigation experiments [12] and in field conditions in the vicinity of the source [13]. Of particular value are the findings of Guderian and Stratmann [13], as the second value in table 3 includes the arithmetical average of SO₂ concentrations for the entire cultivation period and, thus, also for periods when there is no exposure to SO₂ (e.g., due to climatic changes), when the plants "recover" from the previous effects [14], often without the presence of visible signs of damage.

Table 2. Maximum Concentrations of SO₂ for Various Plants Arrived at Through Fumigation Experiments [12]

Type of Plants	Maximum Concentration of SO ₂ in mg/m ³
Alfalfa, purple medic, vetch	0.429 - 0.857
Spring wheat, oats, spinach	0.572 - 0.857
Kidney beans, lettuce	0.572 - 1.144
Strawberries, roses	0.572 - 2.287
Potatoes, spring beets, radishes	0.857 - 2.287
Sugar-beet, cauliflower	1.144 - 2.287

Intensive research is currently focussing on the study of the effects of low concentrations of SO₂, which, as regards effects on plants, are much more dangerous than high concentrations. While in the thirties concentrations of SO₂ around 5.7 mg/m³, and in the mid sixties still 0.57 mg/m³ were deemed to be the limit for causing damage to plants, it appears that it is precisely the low values around 0.057 mg/m³ that can cause substantial damage to vegetation during protracted exposure [1]. High concentrations produce acute damage to plants that is outwardly visible. Low, chronically acting concentrations leave no visible signs in the early stages of exposure, but have detrimental effects on the basic physiological processes of plant life -- photosynthesis, breathing, the enzymatic system, etc. [7, 16, 17, etc.].

We must stay aware of the fact that in most cases the situation in terrain conditions is substantially more complicated. Sulphur dioxide also never acts in isolation, but in conjunction

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with its accompanying components of solid fallout (flue ashes or dust), the physicochemical properties of which can quite substantially affect the degree of damage to plant life.

Table 3. Maximum Concentrations of SO_2 Arrived at in Field Conditions in the Vicinity of the Source [13].

Types of Plants	Maximum Concentration of SO_2 in mg/m^3	
	During Exposure (t_i)	During Cultivation (t_m)
Fruit trees and berries:		
Gooseberry	0.620 - 0.743	0.028 - 0.057
Currant	0.629 - 0.743	0.028 - 0.057
Apple trees	0.629 - 0.743	0.028 - 0.057
Black cherries	0.629 - 1.258	0.028 - 0.237
Cherries	0.743 - 1.258	0.057 - 0.237
Plums	0.743 - 1.258	0.057 - 0.237
Cereals:		
Wheat	0.686 - 0.800	0.025 - 0.068
Rye	0.800 - 0.886	0.068 - 0.146
Spring wheat	0.657 - 1.086	0.043 - 0.143
Oats	0.657 - 1.086	0.043 - 0.143
Tubers:		
Potatoes	0.600 - 0.657	0.028 - 0.043
Sugar-beet	0.800 - 0.886	0.068 - 0.146
Field fodder:		
Clover	0.800 - 0.886	0.068 - 0.146
Alfalfa	0.800 - 0.886	0.068 - 0.146
Green oats	0.657 - 1.086	0.043 - 0.143
Green rye	0.800 - 0.886	0.068 - 0.146
Green spring beets	0.800 - 0.886	0.068 - 0.146
Vegetables:		
Spinach	0.629 - 0.714	0.028 - 0.057
Carrots	0.800 - 1.400	0.068 - 0.297
Tomatoes	0.886 - 1.629	0.146 - 0.354

t_i - 10-minute exposure to SO_2

t_m - arithmetic averages for entire period of cultivation

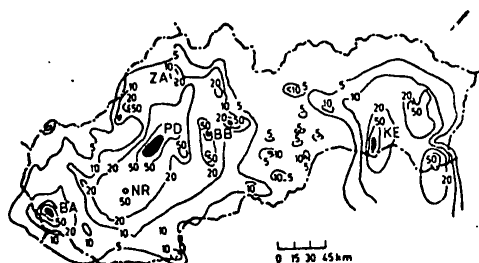
Note: The original expresses SO_2 concentrations in ppm.

Areas in which sulphur dioxide poses potential danger to agricultural crops in the Slovak Socialist Republic are shown in ill. 1. Three extensive regions with a high degree of air pollution stand distinctly apart from other Slovak regions: Bratislava, the region of Horna Nitra, Ziar on the Hron River, and

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Kosice. These are joined by the vicinity of Vojany and Banska Bystrica. The situation is particularly precarious at Horna Nitra, where the maximum annual concentration of SO_2 ranges between 0.20 to 0.25 mg/m^3 , in the remaining regions mentioned above the average annual concentration of SO_2 at maximum concentration locations ranges between 0.05 to 0.076 mg/m^3 . At the same time, areas in which the average concentration of SO_2 ranges between 0.025 to 0.050 mg/m^3 [18] ought to be regarded as highly polluted regions, as it correlates with the 3rd to 5th class of air purity according to Marzeyev [19].



SO_2 concentrations of less than or equal to 100 $\mu\text{g}/\text{m}^3$ in black.

Illustration 1. Areas of Average Concentrations of SO_2 in Slovakia (in $\mu\text{g}/\text{m}^3$) [18]

In view of the current state of knowledge, as well as in regards to the above mentioned data, we deem it necessary to point out that our contemporary standards will not meet actual requirements. While at the time of their origin they were devised innovatively, at the present they fail to meet the requirements of biologists, criteria of environmental protection [20], and not even those for intensification of agricultural mass production.

Technical literature already presents us with more up-to-date approaches based on data derived from hundreds of thousands of measurements. As an example, we present the outline of proposed maximum concentrations of SO_2 (table 4) for plant protection in the GDR [21].

CONCLUSION

The current state and prospective developmental trends of our fuel and energy base in the immediate future call for devoting extraordinary attention to the problems of the effects of air

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Table 4. Proposed Standards Against SO₂ Pollution for Plant Protection in the GDR [21].

Plant Varieties	Average concentrations in mg/m ³			
	Per year	Per Growth Period	30 minutes not exceed. time %	
			2.5%	5.0%
1. Most sensitive varieties: Abies, Picea, Juglans, Ribes, Trifolium, Medicago	0.06	0.05	0.25	0.22
2. Sensitive varieties: Picea, Pinus, Larix, Tilia, Malus, Hordeum, Avena, Secale, Triticum	0.09	0.08	0.40	0.35
3. Less sensitive varieties: Acer, Alnus, Populus, Quercus, Prunus, Rosa, Solanum, Zea, Vitis, Beta, Brassica and family Liliaceae	0.13	0.12	0.60	0.53

pollution on economically significant plant life. The increasing trend in predicted expectable damages to agriculture ought to provide a strong incentive for minimizing losses to pollutants not only in plant production, but in regards to the vegetation cover in general, not excluding thereby also the aspects of preserving soil fertility and other prerequisites to healthy living conditions for mankind.

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